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ABSTRACT

This paper discusses Minnesota Multiphasic Personality Inventory (MMPI) data obtained from individuals exposed to chlorine dioxide in the workplace who developed Multiple Chemical Sensitivity Syndrome. The paper explores current research on chlorine dioxide exposed persons who were misdiagnosed on the basis of MMPI interpretations. Difficulties may exist in using the MMPI or MMPI-2 in psychological assessment due to potential validity problems. It is recommended that more data be collected to determine if current MMPI data should be updated to reflect newer disease entities involving multiple organ systems. (SR)

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# CHLORINE DIOXIDE INDUCED MULTIPLE CHEMICAL SENSITIVITY: MMPI VALIDITY PROBLEMS

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Abstract

This paper discusses MMPI data obtained from individuals exposed to chlorine dioxide in the workplace and who developed *Multiple Chemical Sensitivity Syndrome* (*MCS*). Difficulties may exist in using the MMPI or the MMPI-2 in psychological assessment due to potential validity problems in interpreting extensive Mayo Clinic data collected by Swenson, Pearson, & Osborne (1973). It is recommended that more data be collected to determine if current MMPI actuarial data and algorithms should be updated to reflect the newer disease entities involving multiple organ systems.

## CHLORINE DIOXIDE INDUCED MULTIPLE CHEMICAL SENSITIVITY: MMPI VALIDITY PROBLEMS

Chlorine is a greenish-yellow gas with a pungent odor. It is used as a disinfectant in water purification, and as an anti-bacterial cleaning agent in the food processing industry. Chlorine is also widely used in the home as a disinfecting and stain-removing cleaning agent. The food industry has tended to use chlorine in a liquid form, chlorine dioxide ($ClO_2$). The most common form of chlorine found in the home is "*household bleach*", consisting of approximately 5.25% sodium hypochlorite and 94.75% inert ingredients (water). Chlorine bleach is found in many powdered and liquid mild abrasive household cleansers. Chlorine has been generally thought to be a safe and effective disinfectant, but few are aware that chlorine was one of the first substances used in chemical warfare during World War I.

In the gaseous form, exposure to chlorine can be extremely irritating to skin, eyes, and mucous membranes (Rosenberg, 1992). High concentrations can cause choking, nausea, vomiting, tightness in the chest, watering of the eyes, and stinging of the throat. It now appears that intense prolonged exposure to chlorine can potentially lead to a disorder known as *Multiple Chemical Sensitivity Syndrome* (Bell, Miller, & Schwartz, 1992; Kilburn, 1993; Meggs, 1993; Norseth, 1994), which has been difficult for physicians or psychologists to diagnose (Behm, 1992).

*Multiple Chemical Sensitivity Syndrome* (*MCS*) has been defined as one clinical entity in which exposure to chemical inhalants gives rise to disease

(Meggs, 1993). However, many psychology investigators have concluded that increased prevalence of depression, anxiety, and somatization or somatoform disorders in *MCS* patients accounts for the clinical picture (Bell, Miller, & Schwartz, 1992). This paper will discuss MMPI data obtained from individuals exposed to chlorine dioxide in the workplace who developed *MCS*, and difficulties that may be inherent in using the MMPI in the psychological assessment of *MCS* patients.

It is probable that nearly every practicing psychologist has been asked on at least one occasion to conduct a psychological assessment of a client to determine or rule out the presence of a somatoform disorder. The referral may come from a physician, as typically occurs in one's primary work setting, or could come from an attorney working either for the plaintiff or the defendant in a civil litigation proceeding. It is equally probable that one of the assessment instruments of choice will be the MMPI, or the MMPI-2.

Although high intercorrelations among the basic MMPI clinical scales make their value in differential diagnosis questionable (Anastasi, 1982), in order to facilitate clinical scale interpretations, Hathaway and Meehl (1951) developed an *Atlas* of coded profiles with accompanying case descriptions. This was followed by other similar "cookbooks" (Dahlstrom, Welsh, & Dahlstrom, 1972; Gilberstadt & Duker, 1965; Graham, 1977; Lachar, 1974; Marks, Seeman, & Haller, 1974), and an ambitious study of 50,000 medical patients by Swenson, Pearson, & Osborne (1973).

A common finding in using the MMPI with clients exhibiting physical disorders, or even *Multiple Chemical Sensitivity Syndrome* (*MCS*), is

the profiles obtained often suggest existence of a somatoform disorder. A potentially serious flaw exists in interpreting Swenson, Pearson, & Osborne's (1973) data. In their study, Swenson, Pearson, & Osborne reported MMPI data for 50,000 male and female patients at the Mayo Clinic. The hypothesis in this study was medical problems would upset patients and this would be reflected in very deviant scores on the MMPI (Graham, 1990). The mean profiles fell within "normal" limits, with the validity scales showing a slightly defensive test-taking attitude, and with T-scores on Scales *1* (Hs), *2* (D), and *3* (Hy) near 60. The authors interpreted this to mean the medical problems of the patients tested were not emotionally distressing enough to lead to grossly elevated MMPI scores.

However, the patients tested were already hospitalized in the Mayo Clinic, one of the foremost medical centers in the world. If patients were emotionally upset about medical issues, they were in one of the best medical institutions in the world to have both the medical and emotional issues of a disease entity assessed and treated. Thus, MMPI scores would not be elevated, which may be a variable Swenson, Pearson, & Osborne overlooked in their data analysis.

An MMPI composite profile of seven women diagnosed with *MCS* is presented in *Figure 1* below. These women had been exposed to chlorine dioxide in the workplace, which led to "reactive airway disease" and *MCS*. At present, they remain incompletely treated, and were never hospitalized for their condition. They represent those who could and are misdiagnosed as having either somatization disorders or somatoform disorders on the basis

of MMPI coded profiles and automated interpretations.

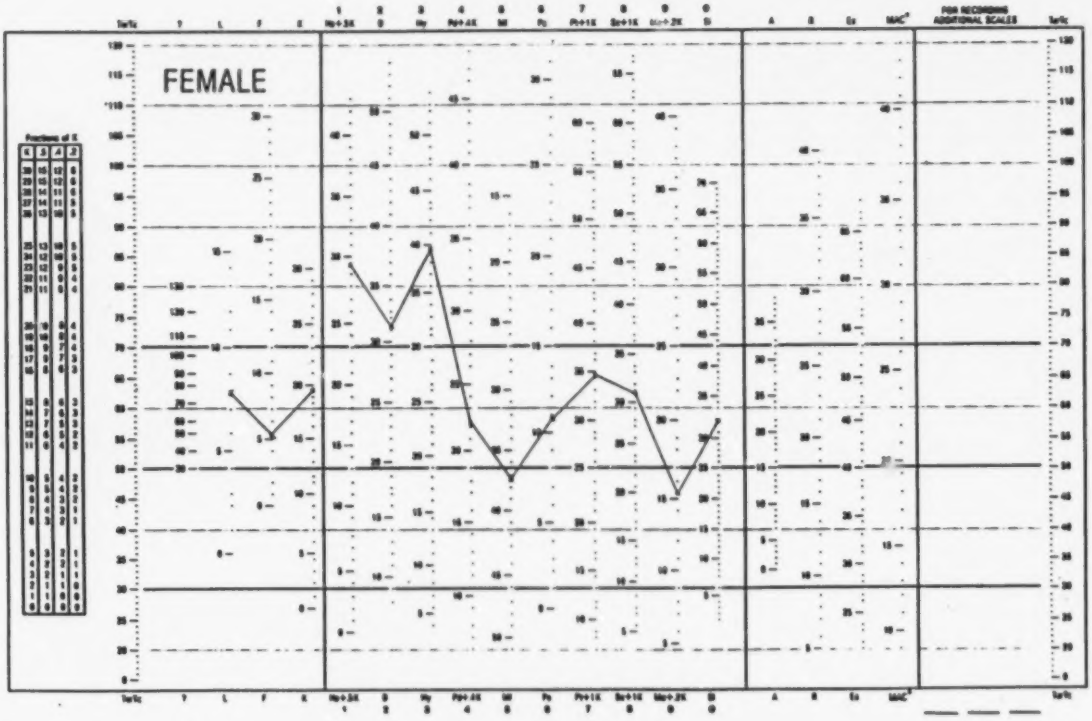


**Figure 1: Composite MMPI profiles on 7 female patients with *MCS***

*MCS* is considered a clinical entity in which exposure to chemical irritants gives rise to disease (Meggs, 1993) and could have neurogenic inflammation arising from stimulation of chemical irritant receptors in the airway and on the skin. Individuals suffering from MCS report that low levels of common indoor and outdoor environmental chemicals trigger chronic polysymptomatic conditions. MCS is suspected to be caused by an olfactory-limbic system dysfunction (Bell, Miller, & Schwartz, 1992). It now appears that many chemicals and solvents once thought to be safe are

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to reflect the newer disease entities that do involve multiple organ systems (i.e., toxic exposures; HIV; AIDS; Chronic Fatigue Syndrome; Lyme's Disease, etc.). It is also hoped psychologists will work more closely with physicians in thoroughly examining a patient's medical background before relegating them to having a somatoform disorder, most especially in forensic cases.

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